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EXAMINER

BROCK II, PAUL E

ART UNIT

PAPER NUMBER

2815

DATE MAILED: 09/16/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/733,418

Applicant(s)

AKRAM, SALMAN

Examiner

Paul E Brock II

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 05 August 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 25-43 and 45-56 is/are pending in the application.
- 4a) Of the above claim(s) 32,39,42,45-49 and 55 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 25-31,33-38,40,41,43,50-54 and 56 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 08 December 2000 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Election/Restrictions

1. Applicant's election without traverse of Species I in Paper No. 5 is acknowledged.

After further review of the claims it has been determined that claim 44 clearly reads on non-elected Species II and therefore has not been examined further.

2. Claims 32, 39, 42, 44 – 49 and 55 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected species, there being no allowable generic or linking claim. Election was made **without** traverse in Paper No. 5.

Specification

3. The specification is objected to as failing to provide proper antecedent basis for the claimed subject matter. See 37 CFR 1.75(d)(1) and MPEP § 608.01(o). Correction of the following is required: It is not clear where a “substantially uniform insulative material” is defined in the specification.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it

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pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

5. Claims 25 – 31, 33 – 38, 40 – 41, 43, 50 – 54 and 56 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. It is not clear where in the originally filed specification a “substantially uniform insulative material” is disclosed.

6. Claims 40 – 41 and 43 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. It is not clear where in the originally filed specification “an oxide filler substantially devoid of other constituents” is disclosed.

7. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

8. Claims 25 – 31, 33 – 38, 40 – 41, 43, 50 – 54 and 56 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

9. The term "substantially uniform" in claims 25, 30, 34, 37, 38, 50, 53 and 54 is a relative term which renders the claims indefinite. The term "substantially uniform" is not defined by the

claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. It is not clear how “substantially uniform” further defines the insulative material. Is the insulative material completely uniform, or can there be some discontinuities in the insulative material?

10. The term "substantially devoid of other constituents" in claim 40 is a relative term which renders the claims indefinite. The term "substantially devoid of other constituents" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. It is not clear how “substantially devoid of other constituents” further defines the oxide filler. Is the oxide filler completely devoid of other constituents, or can there be some other constituents in the insulative material?

11. Claims 26, 35, 41 and 51 recites the limitation "the depth of a bordering diffusion region" in the second line of the claims. There is insufficient antecedent basis for this limitation in the claims. For purposes of this action “the depth of a bordering diffusion region” will be considered --a depth of a bordering diffusion region--.

Claim Rejections - 35 USC § 102

12. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

13. Claims 50 – 54 and 56 are rejected under 35 U.S.C. 102(b) as being anticipated by Sasaki (USPAT 4471525).

With regard to claim 50, Sasaki discloses in figure 4c forming a trench (47) into a semiconductor substrate (43). Sasaki discloses in figure 4d forming a single layer dielectric lining (49) on the surface of the trench. Sasaki discloses in figures 4e – 4f forming a semiconductive spacer (120) along the sidewall of the trench over and in direct contact with the single layer dielectric lining. Sasaki discloses in figure 4g forming substantially uniform insulative material (53) in the trench at least partially by substantially consuming the semiconductive spacer and the single layer dielectric lining to substantially fill the trench with the substantially uniform insulative material.

With regard to claim 51, Sasaki discloses in figure 4h wherein an overall depth of the trench is two times a depth of a bordering diffusion region (42).

With regard to claim 52, Sasaki discloses in figures 4a further comprising the step of forming an insulation layer (44) on the semiconductor substrate prior to the step of forming a first trench.

With regard to claim 53, Sasaki discloses in figures 4f and 4g annealing the semiconductor assembly in the presence of an oxidizing agent.

With regard to claim 54, Sasaki discloses in figure 4h, column 9, line 63 and column 10, line 23 wherein the insulative material and the dielectric lining are the same material.

With regard to claim 56, Sasaki discloses in figures 4a – 4h wherein the process uses only one mask (44) to form the device isolation.

Claim Rejections - 35 USC § 103

14. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

15. Claims 25 – 31, 33 – 38, 40, 41 and 43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sasaki in view of Kameyama (USPAT 4472240).

With regard to claim 25, Sasaki discloses in figures 4a – 4h forming a first trench into a semiconductor substrate. Sasaki discloses in figures 4a – 4h forming a single layer dielectric lining on the surface of the first trench. Sasaki discloses in figures 4a – 4h forming a spacer along the sidewall of the first trench over and in direct contact with the single layer dielectric lining. Sasaki discloses in figures 4a – 4h forming a substantially uniform insulative material in the first trench at least partially by substantially consuming the spacer and the single layer dielectric lining to substantially fill the first trench with the substantially uniform insulative material. Sasaki does not disclose forming a second trench into the substrate assembly at the bottom of the first trench while using the spacer as an etching guide. Kameyama teaches in figure 4e forming a second trench (107) into the semiconductor substrate assembly at the bottom of a first trench (104) by using a spacer (106a and 106b) as an etching guide. It would have been

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obvious to one of ordinary skill in the art at the time of the present invention to use the etching of the second trench of Kameyama in the method of Sasaki in order to form an element isolation region in a self-aligned manner with excellent controllability without forming a cavity therein as stated by Kameyama in column 2, lines 51 – 55. Kameyama also teaches in column 4, lines 18 – 25 forming an oxide filler in the first and second trenches substantially filling the first and second trenches. Therefore, it would further have been obvious to combine the method of filling the trenches of Sasaki and Kameyama.

With regard to claim 26, Sasaki discloses in figures 4a – 4h wherein an overall depth of the first trench is two times the depth of a bordering diffusion region where the depth of the diffusion region is determined by the depth of an area containing at least approximately 90% concentration of conductive atoms. It would be further obvious in the method of Sasaki and Kameyama that the depth of the first and second trench would have been two times the depth of a bordering diffusion region where the depth of the diffusion region is determined by the depth of an area containing at least approximately 90% concentration of conductive atoms.

With regard to claim 27, Sasaki discloses in figures 4a – 4h wherein the spacer is formed from an oxidizable material.

With regard to claim 28, Kameyama discloses in column 3, lines 60 – 68 wherein the spacer is formed of oxide.

With regard to claim 29, Sasaki discloses in figures 4a – 4h further comprising the step of forming an insulation layer on the semiconductor substrate prior to the step of forming a first trench.

With regard to claim 30, Sasaki discloses in figures 4a – 4h annealing the semiconductor assembly in the presence of an oxidizing agent.

With regard to claim 31, Sasaki discloses in figure 4h, column 9, line 63 and column 10, line 23 wherein the insulative material and the dielectric lining are the same type material.

With regard to claim 32, Sasaki discloses in figures 4a – 4h wherein the dielectric lining inhibits becoming oxidized.

With regard to claim 33, Sasaki discloses in figures 4a – 4h wherein the process uses only one mask to form the device isolation.

With regard to claim 34, Sasaki discloses in figures 4a – 4h forming a first trench into a semiconductor substrate. Sasaki discloses in figures 4a – 4h forming a single layer dielectric lining on the surface of the first trench. Sasaki discloses in figure 8c forming a semiconductive spacer along the sidewall of the first trench over and in direct contact with the single layer dielectric lining. Sasaki discloses in figure 8d forming a substantially uniform insulative material in the first trench at least partially by substantially consuming the semiconductive spacer and the single layer dielectric lining during formation to substantially fill the first trench with the substantially uniform insulative material. Sasaki does not disclose forming a second trench into the semiconductor substrate assembly at the bottom of the first trench while using the spacer as an etching guide. Kameyama teaches in figure 4e forming a second trench (107) into the semiconductor substrate assembly at the bottom of a first trench (104) by using a spacer (106a and 106b) as an etching guide. It would have been obvious to one of ordinary skill in the art at the time of the present invention to use the etching of the second trench of Kameyama in the method of Sasaki in order to form an element isolation region in a self-aligned manner with

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excellent controllability without forming a cavity therein as stated by Kameyama in column 2, lines 51 – 55. Kameyama also teaches in column 4, lines 18 – 25 forming an oxide filler in the first and second trenches substantially filling the first and second trenches. Therefore, it would further have been obvious to combine the method of filling the trenches of Sasaki and Kameyama. Sasaki discloses in figures 4a – 4h planarizing the substantially uniform insulative material. Sasaki discloses in figures 4a – 4h wherein the process uses only one mask to form the device isolation.

With regard to claim 35, Sasaki discloses in figures 4a – 4h wherein an overall depth of the first trench is two times the depth of a bordering diffusion region. It would be further obvious in the method of Sasaki and Kameyama that the depth of the first and second trench would have been two times the depth of a bordering diffusion region.

With regard to claim 36, Sasaki discloses in figures 4a – 4h further comprising the step of forming an insulation layer on the semiconductor substrate prior to the step of forming a first trench.

With regard to claim 37, Sasaki discloses in figures 4a – 4h annealing the semiconductor assembly in the presence of an oxidizing agent.

With regard to claim 38, Sasaki discloses in figure 4h, column 9, line 63 and column 10, line 23 wherein the insulative material and the single layer dielectric lining are the same type material.

With regard to claim 40, Sasaki discloses in figures 4a – 4h forming a first mask over a silicon substrate assembly. Sasaki discloses in figures 4a – 4h forming a first trench into the silicon substrate assembly using the mask as an etching guide. Sasaki discloses in figures 4a –

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4h forming an oxide layer on the surface of the first trench. Sasaki discloses in figures 4a – 4h forming a silicon spacer on the sidewall of the first trench over and in direct contact with the single layer dielectric lining. Sasaki discloses in figures 4a – 4h forming an oxide filler substantially devoid of other constituents in the first trench at least partially by substantially consuming the silicon spacer and the oxide layer to substantially fill the first trench with the oxide filler. Sasaki does not disclose forming a second trench into the semiconductor substrate assembly at the bottom of the first trench while using the spacer as an etching guide. Kameyama teaches in figure 4e forming a second trench (107) into the semiconductor substrate assembly at the bottom of a first trench (104) by using a spacer (106a and 106b) as an etching guide. It would have been obvious to one of ordinary skill in the art at the time of the present invention to use the etching of the second trench of Kameyama in the method of Sasaki in order to form an element isolation region in a self-aligned manner with excellent controllability without forming a cavity therein as stated by Kameyama in column 2, lines 51 – 55. Kameyama also teaches in column 4, lines 18 – 25 forming an oxide filler in the first and second trenches substantially filling the first and second trenches. Therefore, it would further have been obvious to combine the method of filling the trenches of Sasaki and Kameyama. Sasaki discloses in figures 4a – 4h planarizing the oxide filler.

With regard to claim 41, Sasaki discloses in figures 4a – 4h wherein an overall depth of the first trench is two times the depth of a bordering diffusion region. It would be further obvious in the method of Sasaki and Kameyama that the depth of the first and second trench would have been two times the depth of a bordering diffusion region.

With regard to claim 43, Sasaki discloses in figures 4a – 4h annealing the semiconductor assembly in the presence of an oxidizing agent.

Response to Arguments

16. Applicant's arguments filed August 5, 2002 have been fully considered but they are not persuasive.

17. In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

18. In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Paul E Brock II whose telephone number is (703)308-6236. The examiner can normally be reached on 8:30 AM-5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie Lee can be reached on (703)308-1690. The fax phone numbers for the organization where this application or proceeding is assigned are (703)308-7722 for regular communications and (703)308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)308-0956.

Paul E Brock II
September 13, 2002



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